SODIUM METABISULFITE

CAS number: 7681-57-4

Synonyms: Disodium disulphite; Sodium pyrosulfite

Molecular formula: $Na_2S_2O_5$

TLV–TWA, 5 mg/m^3

A4 — Not Classifiable as a Human Carcinogen

Summary

A TLV–TWA of 5 mg/m^3 is recommended for occupational exposure to sodium metabisulfite to minimize the potential for irritation of the upper respiratory tract and mucous membranes. Negative adverse effects, including oncogenicity in rats fed sodium metabisulfite in their diet for 2 years, warrant an A4, Not Classifiable as a Human Carcinogen, notation. Overall, sodium metabisulfite is considered a substance of very low order systemic toxicity. Sufficient data were not available to recommend Skin or SEN notations or a TLV–STEL.

Chemical and Physical Properties

Sodium metabisulfite is a white powder or crystals with an odor of sulfur dioxide. It may be considered to be the anhydride of sodium bisulfite and is reportedly the chief constituent of the commercial grade of the latter compound.[1] Chemical and physical properties include:[2,3]

Molecular weight: 190.13

Specific gravity: 1.4

Decomposes: > 150°C

Solubility: freely soluble in water and glycerol; slightly soluble in alcohol

Major Uses

Sodium metabisulfite is used as a food preservative and as an antioxidant in pharmaceuticals.[4]

Animal Studies

A review of the *in vitro* and *in vivo* (via ingestion) toxicology of metabisulfite and other sulfites has been summarized by Gunnison.[5]

Acute

An intravenous injection of sulfite solution, prepared from sodium metabisulfite, at a dose of 192 mg/kg was lethal for one of five rabbits;[6] 115 mg/kg is the LD_{50} for rats.[7] The primary response in mice exposed to aerosols of sodium metabisulfite was sensory irritation of the upper respiratory tract. The response was comparable to that seen after exposure to sulfur dioxide.[8]

Subchronic

Feeding 0.6% sodium metabisulfite to rats for 5 to 7 weeks was associated with reduced body weight gain caused by thiamine deficiency induced by the *in vitro* destruction of the vitamin in the diet by the sulfite.[9,10] Such effect occurs neither *in vivo*[11] nor when sulfites are administered in drinking water.[12]

Chronic

A 2-year feeding of 0.215% sodium metabisulfite to rats produced no adverse effects.[13] These data indicate a very low order of systemic toxicity. Extrapolation of these data to humans, allowing a 100-fold uncertainty factor and assuming equivalent bioavailability, would give an equivalent air concentration of 7.0 mg/m^3.[14]

Reproductive/Developmental Studies

In a three-generation feeding study of sodium metabisulfite, rats were fed 0.7, 1.5, 3, 6, or 13 mmol/kg/day; reduced body weight gain was observed in the F_1 and F_2 generation. There was no effect on birth weights, number of offspring/litter, or other parameters of reproductive success.[13] Based on these data, the World Health Organization[15] calculated a maximum acceptable daily intake (ADI) for humans of 0.7 mg sulfite (as sulfur dioxide)/kg body weight.

Human Studies

Two cases of occupational asthma in laundry workers exposed to sodium metabisulfite were reported.[14] Sodium metabisulfite used as a preservative in vinegar provoked severe asthma in a 67-year-old woman who ate salad with vinegar-based dressing.[16]

TLV Recommendation

The Food and Agriculture Organization/World Health Organization of the United Nations[15] established an ADI for sodium metabisulfite of 0.7

mg sulfite/kg body weight. While it may react somewhat more slowly than sodium bisulfite, sodium metabisulfite has the same basic pharmacologic properties.[5,15] Some irritation of mucous membranes would be expected from inhalation of the dust. A TLV–TWA of 5 mg/m^3, the same as that for sodium bisulfite (see the current *TLV Documentation* for Sodium bisulfite), is recommended for sodium metabisulfite. A 2-year feeding study of sodium metabisulfite in rats produced no adverse effects.[13] Accordingly, a carcinogenicity notation of A4, Not Classifiable as a Human Carcinogen, is assigned to sodium metabisulfite.

Sufficient data were not available to recommend Skin or SEN notations or a TLV–STEL. The reader is expected to be familiar with the section on *Excursion Limits* in the "Introduction to the Chemical Substance TLVs" of the current edition of the *Documentation of the TLVs and BEIs* for the guidance and control of excursions above the TLV–TWA, even when the 8-hour TWA is within the recommended limit.

Historical TLVs

1978: *Proposed:* TLV–TWA, 5 mg/m^3
1980–present: TLV–TWA, 5 mg/m^3
1995: A4, Not Classifiable as a Human Carcinogen
1996–present: TLV–TWA, 5 mg/m^3; A4

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